The heating power of these coals compares favorably with that had from the majority of semi-bituminous and many bituminous coals. They should be burned in boilers adapted for use with bituminous coals.

As gas coals, Excelsior and Mine No. 3 possess fair qualities. They yield a very large amount of gas, and with a little enrichment (either by the admixture of cannel or a small amount of oils) will prove serviceable to the gas-maker.

If these samples are from outcrop or from near the surface, it will most likely be found that the quality of the coal will improve, as it is obtained from a greater depth; so that without any limitation in the quantity of gas yielded, they will compare more favorably with the eastern bituminous coals for gas purposes. Respectfully,

CHARLES M. CRESSON, M. D.

SYNOPSIS OF THE VERTEBRATA OF THE MIOCENE OF CUMBERLAND COUNTY, NEW JERSEY.

By E. D. Cope.

(*Read before the American Philosophical Society, Feb.* 5, 1875.)

The marls of the Miocene period appear in a limited area in Southwestern New Jersey, chiefly in Cumberland County. Their mineral character is similar to that of the marls of the same age in the Southern Atlantic States, viz.: a calcareous clay containing small percentages of phosphate of lime and potash. In New Jersey its strata abound in shells, and Vertebrate remains are rather common. Timothy A. Conard, the father of our Marine Tertiary Geology, as early as 1832, in his "Fossil Shells of the Tertiary," called it the upper marine formation, and stated that it "first appears in New Jersey, southeast of Salem, and continues throughout all the States south of this." Professor Rogers, in his Geology of New Jersey, published in 1840, p. 293, calls the beds Tertiary, and remarks "though this proposition (of shells) might rather imply an Eocene date for the deposit .... while on the other hand all the species are either identical with those of the Miocene of Maryland and Virginia, or exhibit a close analogy of form." In a memoir read before the American Philosophical Society, and published in the volume of Transactions for 1837, p. 334 Prof. Rogers, assigns the corresponding beds in Eastern Virginia to the Miocene period. The evidence derived from the vertebrate fossils does not conflict with this view. A full account of the geology of the formation as it appears in New Jersey, is given by Prof. G. H. Cook, in his report of the Geological Survey of New Jersey, 1868.

ELASMOBRANCHII.

LAMNA ELEGANS.
LAMNA CUSPIDATA.
LAMNA DENTICULATA.
OXYRHINA XIPHODON.
OXYRHINA MINUTA.
OTODUS APPENDICULATUS.
CARCHARODON MEGALODON.
CARCHARODON ANGUSTIDENS.
HEMIPRISTIS SERRA.
ZYGAENA PRISCA.
GALEOCERDO ADUNCUS.
GALEOCERDO EGERTONII.
NOTIDANUS PRIMIGENIUS.
AËTOBATIS SP.
MYLIOBATIS SP.
ZYGOBATIS SP.

PLINTHICUS STENODON, Cope, Proceed. Boston Soc. Nat. History, 1867, p. 316.

PRISTIS AMBLODON, Cope, ibidem, 312.

ACTINOTERI.

PHYLLODUS CURVIDENS, Marsh, Proceed. Amer. Assoc. Adv. Science, 1870, p. 229.

CROMMYODUS IRREGULARIS, Cope, Proceed. Amer. Philos. Society, 1869, p. 243; Proceed. Boston Soc. Nat. History, 1869, p. 311.

PHASGANODUS GENTRYI, Cope, sp. nov.

Represented by one of the long teeth of the anterior part of the jaws. It is slender and curved backward, and the anterior view presents a cutting edge from the apex to the base; there is no cutting edge nor angle on the posterior face, unless it be at the apex, which is broken off in the specimen. On one side the cementum is smooth; on the other, and posteriorly, the crown is keeled-striate from the base to near the apex. Length preserved, .010; long diameter at base, .0022; do. near apex, .0020; short diameter at base, .0012. Dedicated to my friend Thomas C. Gentry, of Philadelphia, an acute observer of nature.

SPYRAENODUS SPECIOSUS, Leidy, *Sphyraena speciosa*, Leidy, Proceed. Acad, Nat. Sciences, 1856, p. 221.

SPHYRAENODUS SILOVIANUS, Cope, sp. nov.

Represented principally by a portion of the dentary bone, supporting five teeth, and containing alveoli for four others. The jaw is compressed and slightly curved and with smooth surface. The teeth are subequal, compressed, rather short and acute, and without roots; at their bases the alveolar borders are notched. Length of fragment, .020; depth at middle, .004; length of a tooth, .003; long diameter at base, .002.

Reptilia.

Trionyx lima, Cope, Ext. Batr. Rept. N. Amer., 1870, p. 153. Pl. vii. Fig. 14.

Puppigerus grandævus, Leidy, *Chelone grandæva*, Leidy, Proceed. Acad. Philadelphia, 1861, p. 203; *Puppigerus grandævus*, Cope, Ext. Baltr. Rept. N. A., 1870, p. 235.

Thecachampsa sericodon, Cope, Proceed Acad. Phila., 1867, p. 143; Ext. Batr. Rept. N. Amer., 1870, p. 43, Pl. v. Fig. 8.

Incertae sedis.

Agabelus porcatus, Cope, gen. et sp. nov.

Established on an osseous body which nearly resembles the elongate muzzle of a *Priscodelphinus* without teeth, but with the alveolar lines excavated into a deep groove on each side. The superior surface possesses a shallow median groove as in most delphinoid cetaceans, while the supposed palatal face is plane and sharply defined by the lateral grooves. The latter are bounded above by a thin overhanging border on each side, and their fundus is marked by a series of nutritious foramena of small size, apparently corresponding to the positions of teeth of other genera.

With this imperfect material it is impossible to decide positively on the character of this genus, but I suspect that it will be found to be allied to the sword-dolphins of the genus *Rhabdosteus*, Cope.

Char. Specif. The general form is depressed, and the outline tapers regularly to near the apex. The upper face presents two convexities, one on each side of the median groove, but towards the base these parts are not exactly symmetrical. There is a narrow bevel descending to the margin on each side. The grooves are wide and deep, anteriorly wider than the palatal rib which separates them, and opening outward as well as downwards. Bone moderately dense, surface not covered with the cementum and faintly longitudinally line-grooved. Total length of fragment, M. .065; width do. at base, transversely .012, vertically, .006; with palate at base .007; at broken extremity, .002; depth at do. .0035.

Mammalia.

Squalodon atlanticus, Leidy, Cope, Proceed. Academy, Philada., 1867, p. 153; *Macrophoca atlantica*, Leidy, *l. c.* 1856, p. 220.

Zarhachis velox, Cope, Proceed. Acad. Philadelphia, 1869 (March).

Priscodelphinus harlani, Leidy, Proceed. Acad. Phila., 1851, p. 327.

Priscodelphinus lacertosus, Cope, *Delphinapterus lacertosus*, Cope, ibidem, 1868, p. 190.

Priscodelphinus grandævus, Leidy, ibidem, 1851, p. 327. *Tretosphys grandævus*, Cope, ibidem, 1869 (March).

Priscodelphinus uraeus, Cope, *Tretosphys uraeus*, Cope, 1869 (March).

The four preceding species may be regarded as congeneric for the present, as they are similar in the forms of the vertebræ, especially in

the lumbar diapophyses. A few years ago I defined a genus, based on several species from the Miocene of Maryland, in which the lumbar diapophyses are spiniform. Supposing the *Priscodelphinus harlani* of Leidy to possess the same character I retained the same generic name for the Maryland species. After an examination of considerable material from the New Jersey locality, including bones of *P. harlanii*, I have failed to observe a single species with the spinous processes alluded to. It thus becomes evident that *Priscodelphinus* must be retained for the species termed by me *Tretosphys*, while that for which I retained the name *Priscodelphinus* must receive a new one. For this I propose *Belosphys* with *B. spinosus*, Cope, as type, and *B. atropius*, *B. conradi* and *B. stenus* as species. At the same time I add that the presence of *Ixacanthus coelospondylus*, Cope, in the New Jersey Miocene mentioned in Cook's Geological Survey of New Jersey by the writer, is doubtful.

Total number of species, thirty-three.

ORIGIN OF THE LOWER SILURIAN LIMONITES OF YORK AND ADAMS COUNTIES.

By Persifor Frazer, Jr.

(*Read before the American Philosophical Society, March* 19, 1875.)

The three great deposits of Lower Silurian limestone which occur in this State, are: 1st. That of the Chester Valley which begins at Willow Grove, in Montgomery county, and terminates about a mile west of Minerstown, in Lancaster county; 2d. The great Lancaster and York county basin which, commencing about a mile northeast of Morgantown, crosses the Susquehanna River in two prongs, the longer (most northerly) of which terminates almost on Mason and Dixon's line in the southeast corner of Adams county; and 3d. The great valley, *par excellence*, which enters the State at Easton on the Delaware River, and passes into Maryland in a wide belt, which stretches fifteen miles east and the same distance west of Middleburg, Franklin county.

Accompanying all these limestone basins are belts of iron ore which crop out at tolerably uniform distances below their edges. In the still lower measures of the Silurian, and above the Potsdam sandstone, are other belts of ore entirely disconnected from the limestone ores.

In the first Report of the Geology of Pennsylvania (Vol. I, p. 218), it is stated of the Rathfon Ore Banks of Lancaster county, that in this, as in most of the other iron veins connected with the magnesian limestones,